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NIST RMs/SRMs

SRM 2372 Human DNA Quantitation Standard

Accurate quantification of human deoxyribonucleic acid (DNA) extracts can be critical for specific analysis methods. Forensic DNA identification laboratories rely on reproducible quantitation of extracted human DNA for downstream analysis. Quantitation inaccuracy leads to too much or too little sample being used in the polymerase chain reaction (PCR) amplification process that may lead to wasted time, resources, and potentially the loss of the critical sample. In response to requests from the forensic DNA identification community, SRM 2372 Human DNA Quantitation Standard has been produced. SRM 2372 is intended primarily for use in the value assignment of human DNA extracts and consists of three well-characterized human genomic DNA materials solubilized in TE⁻⁴ buffer¹. The three component genomic DNA materials, labeled A, B, and C, are respectively derived from a single male donor, multiple female donors, and multiple male and female donors. A unit of the SRM consists of one sterile 2 mL vial of each component, each vial containing approximately 110 μ L of DNA solution. This material has been certified for blank-corrected decadic attenuation for a 1.0 cm path length at five wavelengths in the ultraviolet spectral region at a spectral bandwidth of 0.8 nm and a temperature of 22 $^{\circ}$ C \pm 1 $^{\circ}$ C², Table 1. The decadic attenuation, D_{10} , is computed as the negative logarithm (base 10) of the transmittance, and is analogous to absorbance except for the inclusion of scattering and luminescence effects upon the radiant power exiting the sample.³

SRM 2372 also has conventional DNA concentrations of the components supplied as informational values, as shown in Table 2. Using the supplied “conventional” DNA concentration the components of SRM 2372 were tested and found to be compatible with several real-time qPCR quantitation methods.

The Human DNA Identity Project Team of Division 831.01 has conducted several interlaboratory studies to assess the “state of the art” in human DNA quantitation methods used by the forensic DNA community and to determine whether or not a Standard Reference Material for DNA quantification would be useful. In NIST Quantitation Study 2004 (QS04), 80 participants provided 287 independent sets of results from 19 different quantification methods⁴. The expected one standard deviation among-laboratory variability for sub-ng/ μ L DNA mass concentration ([DNA]) samples in QS04 is about a factor of 1.8. (A factor-of-two uncertainty in the amount of template DNA is equivalent to plus or minus a single PCR amplification cycle.) Much of this variability apparently resulted from systematic biases among the 10 quantitative PCR (qPCR) methods used in QS04.

SRM 2372 Human DNA Quantitation Standard (continued)

Table 1. Certified Values of Decadic Attenuance and Their Expanded Uncertainties

Wavelength (nm)	Decadic Attenuance (D_{10})		
	Component A	Component B	Component C
230	0.458 ± 0.024	0.445 ± 0.024	0.446 ± 0.025
260	1.049 ± 0.017	1.073 ± 0.031	1.086 ± 0.018
270	0.859 ± 0.016	0.875 ± 0.021	0.893 ± 0.016
280	0.562 ± 0.014	0.571 ± 0.016	0.585 ± 0.015
330	$0.005^{+0.006}_{-0.005}$	0.005 ± 0.005	$0.005^{+0.009}_{-0.005}$

Table 2. Information Values of Conventional DNA Mass Concentration

Component A (ng/ μ L)	Component B (ng/ μ L)	Component C (ng/ μ L)
52.4	53.6	54.3



- ¹ TE⁻⁴ buffer (10 mmol/L Tris HCl, 0.1 mmol/L EDTA, pH 8.0)
- ² Expanded Uncertainty
- ³ IUPAC Compendium of Chemical Terminology, 2nd Edition (1997).
- ⁴ Kline, M.C., Duewer, D.L., Redman, J.W. and Butler, J.M. (2005) Results from the NIST 2004 DNA Quantitation Study. *J Forensic Sci*, 50(3): 571-578.

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NIST SRM 2451 Fine Carbon (Activated) from Cyanide Ore Leaching

SRM 2451 is a fine powdered carbon (activated) obtained after use in the leaching of ore with cyanide solution. Mercury and gold were determined in this material. The mercury concentration was certified at $688 \mu\text{g/g} \pm 28 \mu\text{g/g}$ by isotope dilution-cold vapor-inductively coupled plasma (ID-CV-ICP-MS). The reference value gold was determined to be $28 \mu\text{g/g} \pm 1.5 \mu\text{g/g}$ by ICP-MS using external standardization. The moisture content is about 15 % as determined between a temperature of 105 °C and 110 °C. A unit of SRM 2451 consists of a 100 g of fine carbon contained in a glass bottle.

The material for SRM 2451 was provided by Newmont Mining Corporation of Denver, Colorado. The starting material for this SRM was pure carbon obtained by the destructive distillation of coconut shells. It was activated by heating with steam or carbon dioxide to 800 °C to 900 °C. This activation process results in a porous structure with high internal surface area that imparts a high adsorptivity for many gases, vapors, colloidal solids, and metals. The material for SRM 2451 was used in conjunction with cyanide solution in the extraction of metals from gold ore and contains absorbed cyanide and metal compounds produced in the gold leaching process.

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NIST SRM 2720 Sulfur in Di-*n*-Butyl Sulfide

SRM 2720 provides a means to accurately assay the sulfur content of commercially available di-*n*-butyl sulfide (DNBS) solutions. Three of the ASTM standard test methods for X-ray fluorescence (XRF) determination of sulfur in petroleum products call for the use of DNBS as the reference reagent (D2622-03, D4294-02 and D4927-02). Measurements of a few commercially available DNBS solutions suggest that their actual sulfur content can show significant differences from the theoretical sulfur mass fraction value of 21.915 %. SRM 2720 was certified by a high accuracy analytical technique, isotope dilution thermal ionization mass spectrometry (ID-TIMS) while homogeneity testing was performed using X-ray fluorescence (XRF).

A unit of SRM 2720 consists of 5 amber ampoules, each containing approximately 10 mL of DNBS sealed under an inert argon atmosphere. The certified mass fraction of sulfur in this SRM together with its associated expanded uncertainty (expressed as a 95 % confidence interval) is $21.912 \% \pm 0.145 \%$. A certified value is a value for which NIST has the highest confidence in its accuracy in that all known or suspected sources of bias have been investigated or accounted for by NIST.

This new SRM will provide a direct means of establishing NIST traceability of sulfur content in commercially available DNBS solutions not afforded by a reliance on stated commercial purity and theoretical calculations of sulfur content.

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NIST SRM 3276 Carrot Extract in Oil

Beta-carotene is used in dietary supplements for its perceived cardiovascular benefits and cancer preventive effects and as a non-toxic source of vitamin A. The accurate measurement of beta-carotene is important to the food and nutrition community because nutrition labeling laws require that vitamin A content (including the contribution from carotenoids) be included on product labels. As part of an interagency agreement, NIST, the National Institutes of Health's Office of Dietary Supplements (NIH/ODS), and the Food and Drug Administration's Center for Drug Evaluation and Research (FDA/CDER) are developing Standard Reference Materials (SRMs) for dietary supplements.

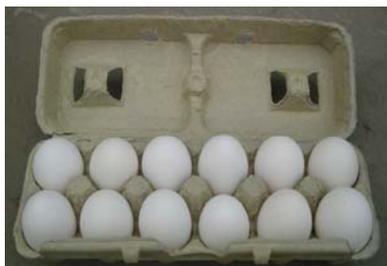


SRM 3276 Carrot Extract Oil

One of these materials is SRM 3276 Carrot Extract in Oil. This material is an infusion of carrots in vegetable oil, and is expected to complement NIST's other SRMs that have values assigned for carotenoids (i.e., SRM 968c Fat-Soluble Vitamins, Carotenoids and Cholesterol in Human Serum, SRM 2383 Baby Food Composite, and SRM 2385 Slurried Spinach). Values in SRM 3276 are assigned for alpha- and beta-carotene, delta- and gamma-tocopherol, and 12 fatty acids. This material is intended for use as a primary control material when assigning values to in-house (secondary) control materials and for validation of analytical methods. Other materials available in the dietary supplement series include cod liver oil and suites of materials containing ephedra and ginkgo. Future dietary supplement SRMs will include a multivitamin/multielement tablet, saw palmetto, bitter orange, green tea, cranberries, blueberries, bilberries, black cohosh, soy, kudzu, red clover, and St. John's wort.

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NIST RM 8445 Spray-Dried Whole Egg for Allergen Detection



There are eight foods – peanuts, milk, eggs, soy, tree nuts, fin fish, shellfish, and wheat – that cause 90 % of food-allergic reactions in the U.S. Until recently, food manufacturers were allowed to state that their products “may contain” traces of these foods if the labeled food was processed in a facility that also processed any of the eight other foods. Allergic consumers were then placed in a position of deciding whether or not it was worth the risk of eating the possibly contaminated food. When FDA randomly tested a number of foods in 1999, they found that 25 % of the foods did not list peanuts or eggs as ingredients on their labels, although they did contain these ingredients. In 2004, the Food Allergen Labeling and Consumer Protection Act was passed, requiring that foods be labeled to indicate that they *do* contain the allergenic foods. Obviously, food manufacturers should know whether any of the allergens are ingredients in their products. It is more difficult to determine whether a food has been contaminated with traces of another food. Typically, test kits based on enzyme-linked immunoassays are used to determine whether trace amounts of allergens have contaminated a product.

Reference Material (RM) 8445 Spray-Dried Whole Egg Powder for Allergen Detection is intended primarily for use in evaluating test kits for determination of the presence of allergenic egg proteins. This material provides a common matrix to the allergen research community, who may wish to conduct studies using such a single broadly available material. RM 8445 was prepared by a group consisting of representatives from the Food Allergy Research and Resource Program (FARRP), Food Products Association (FPA), Health Canada, Institute for Reference Materials and Measurements (IRMM), and U.S. Food and Drug Administration (FDA) Center for Food Safety and Applied Nutrition (CFSAN). This group is the sole authority for all of the information provided in the Report of Investigation, including the reference value for protein and other technical information. One unit of RM 8445 consists of a single bottle containing 5 g of material.

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Renewals

SRM 911c	Cholesterol
SRM 1664a	Sulfur Dioxide in Nitrogen Lot #91-E-XX
SRM 1681b	Carbon Monoxide in Nitrogen Lot #1-K-XX
SRM 1696a	Sulfur Dioxide in Nitrogen Lot #96-D-XX
SRM 3104a	Barium Standard Solution Lot # 070222
SRM 3133	Mercury Standard Solution Lot # 061204
SRM 4239	Strontium-90 Radioactivity Standard (~32 kBq•g ⁻¹)
SRM 4919I	Strontium-90 Radioactivity Standard (~4.2 kBq•g ⁻¹)

Revisions

Certificate Revisions—Are You Using These Materials?

This is a list of our most recent certificate revisions. Users of NIST SRMs should ensure that they have the most recent certificates. NIST updates certificates for a variety of reasons, such as to extend the expiration date or to include additional information gained from stability testing. If you do not have the most recent certificate for your material, you can print or view a copy from the website at:

<http://www.nist.gov/srm> or contact SRM at:

Phone: 301-975-6776 / 301-975-2200 **Fax:** 301-926-4751 **Email:** srminfo@nist.gov

SRM 141d Acetanilide

Editorial Changes;
New Expiration Date:
30 September 2012

**SRM 987 Strontium
Carbonate Isotopic
Standard**

Editorial Changes and
revised as isotopic standard
only

**SRM C1252a
Phosphorus Deoxidized
Copper—CU IX**

Editorial Changes

**SRM 1588b Organics
in Cod Liver Oil**

Editorial Changes

**SRM 1846 Infant
Formula**

Editorial Changes
New Expiration Date:
30 September 2009

**SRM 2031a Metal-on-
Fused-Silica Filters
for Spectrophotometry**

Editorial Changes

**SRM 2092 Low-Energy
Impact Specimen
Lot # LL 107**

Editorial Changes

**SRM 2096 High-Energy
Impact Specimen**

Lot # HH 109
Editorial Changes

**SRM 2098 Super High-
Energy**

Impact Specimen
Lot # SH 32
Editorial Changes

**SRM 2241 Relative
Intensity Correction
Standard for Raman
Spectroscopy**

New Expiration Date:
31 July 2008

**SRM 2399 Fragile X
Human DNA Triplet
Repeat Standard**

New Expiration Date:
31 August 2012

**SRM 2620a Carbon
Dioxide in Nitrogen
Lot #31-F-XX**

New Expiration Date:
01 May 2015

**SRM 2621a Carbon
Dioxide in Nitrogen
Lot #32-D-XX**

New Expiration Date:
01 May 2015

**SRM 2623a Carbon
Dioxide in Nitrogen**

Lot #34-C-XX
New Expiration Date:
01 April 2013

**SRM 2624a Carbon
Dioxide in Nitrogen**

Lot #35-D-XX
New Expiration Date:
01 April 2013

**SRM 2625a Carbon
Dioxide in Nitrogen**

Lot #36-XX-C
New Expiration Date:
01 April 2015

**SRM 2642a Carbon
Monoxide in Nitrogen**

Lot #51-xx-DL
New Expiration Date:
01 May 2015

**SRM 2682b Sulfur, Mercury
and Chlorine in Coal**

Technical addition of chlorine
reference value

**SRM 2683b Bituminous
Coal (Sulfur and Mercury)**

Editorial Changes

Revisions (continued)

SRM 2684b Bituminous Coal (Sulfur and Mercury)
Editorial Changes

SRM 2685b Sulfur, Mercury and Chlorine in Coal
Technical addition of chlorine certified value
New Expiration Date:
01 April 2013

SRM 2692b Sulfur, Mercury and Chlorine in Coal
Technical addition of chlorine certified value

SRM 2693 Sulfur, Mercury and Chlorine in Coal (Bituminous)
Technical addition of chlorine certified value

SRM 2741a Carbon Monoxide in Nitrogen
Lot # 60-B-XX
New Expiration Date:
01 May 2015

SRM 3109a Calcium Standard Solution
Lot # 050825
Editorial Changes

SRM 3191 Aqueous Electrolytic Conductivity
Lot #050403
New Expiration Date:
22 June 2008

SRM 3192 Aqueous Electrolytic Conductivity
Lot #031121
New Expiration Date:
21 October 2008

SRM 3245 Ephedra Dietary Supplement Suite
Editorial Changes

ORDER NIST SRMS ONLINE

You can now order NIST SRMs through our new online ordering system, which is constantly being updated. **PLEASE NOTE:** Purchase orders and credit cards may be used when ordering an SRM online. This system is efficient, user-friendly, and secure. Our improved search picks up keywords on the detail page along with the words in the title of each SRM.

In addition, we are in the midst of a project to add numerous certificate references for each SRM online. Please also note we are adding many historical archive certificates online for your convenience.

<https://srmors.nist.gov>

Please Register Your Certificate Online!

Users of NIST SRMs should ensure that they have the most recent certificates.

<http://www.nist.gov/srd/srmregform.htm>

**SRM 2008 MARKETING CATALOG/CD coming
January 2008**

NIST SRM 2007/2008 Exhibit Schedule

**Chem Show**

October 30-November 1, 2007
Booth # 732
Javits Convention Center
New York City, NY

Eastern Analytical Symposium - EAS

November 12-15, 2007
Booth # 215
Garden State Exhibit Center
Somerset, NJ

Material Research Society Fall Meeting - MRS

November 26-30, 2007
Hynes Convention Center
Boston, MA

American Academy for Forensic Science - AAFS

February 21-23, 2008
Washington DC Convention Center
Washington, DC

Pittsburgh Conference - PITTCON

March 2-7, 2008
Booth # 4512, 4513
Morial Convention Center
New Orleans, LA

Materials Research Society Spring Meeting - MRS

March 25-27, 2008
San Francisco Marriott
San Francisco, CA

American Chemical Society – ACS

April 6-10, 2008
Morial Convention Center
New Orleans, LA

NOBCCHE

March 16-22, 2008
Marriott Downtown
Philadelphia, PA

Analytical

April 1-4, 2008
Munich Trade Fair
Germany

Conference on Precision and Electromagnetic**Measurements - CPEM**

June 8-13, 2008
Omni Interlocken Resort
Broomfield, CO

IFT-Food Expo

June 29 – July 1, 2008
Morial Convention Center
New Orleans, LA

AACC Clinical Lab Expo

July 27-31, 2008
Washington DC
Convention Center
Washington, DC

NCSL Symposium

August 3-7, 2008
Walt Disney World Swan
and Dolphin
Anaheim, CA

American Chemical Society

ACS - August 17-21, 2008
Pennsylvania Convention Center
Philadelphia, PA

Association of Official Chemists – AOAC

September 21-25, 2008
Hyatt Regency Dallas
Dallas, TX

MS&T Show

October 5-9, 2008
David L. Lawrence
Convention Center
Pittsburgh, PA

Materials Research Society Fall Meeting - MRS

December 2-4, 2008
Boston Marriott
Boston, MA